

AN ATYPICAL LARVAL COLOR FORM OF *BAETIS INTERCALARIS* (EPHEMEROPTERA: BAETIDAE) FROM PENNSYLVANIA AND THE KIAMICHI RIVER BASIN OF SOUTHEASTERN OKLAHOMA¹

R.D. Waltz², D.E. Baumgardner^{3,4}, J.H. Kennedy^{4,5}

ABSTRACT: An atypical larval color form of *Baetis intercalaris* was discovered and reared from the Kiamichi River basin of southeastern Oklahoma. Identical nymphs were also recently discovered in northeastern Pennsylvania. This atypical larval color form has been previously reported only from Wisconsin. Larvae of this color form are visually distinctive because they lack the pale triad of spots along the posterior margins of most abdominal tergites diagnostic of the typical color form. The atypical form is uniformly marked on each tergite with pale, anterior, paired incurved lines (parentheses like) on a gray or brown background, lacking the paler abdominal tergites and spots characteristic of typical *B. intercalaris*. No morphological characters in the adult stage or the larval stage were found to support establishment of a new species.

Independently conducted ecological studies of the macroinvertebrates inhabiting two disjunct river systems of North America resulted in the collection of a little reported form of *Baetis intercalaris* McDunnough. This larval color form is characterized by its lack of well developed and contrasting color patterns of the abdominal tergites when compared with the typical color form (see Morihara and McCafferty 1979). Bergman and Hilsenhoff (1978) first reported this unpatterned form in their studies of the Wisconsin Baetidae. The unpatterned form is visually distinctive in field samples and is readily identified as unique due to the flat gray or brown, non-contrasting background color of the abdominal tergites (Fig. 1), typical "intercalaris" type of prothorax pattern (Morihara and McCafferty 1979), and medially banded cerci and terminal filament. No other *Baetis* species in North America is similarly colored.

Larval specimens of the unpatterned form of *B. intercalaris* were collected and reared (by DEB) from the Kiamichi River basin of southeastern Oklahoma. Another series of identical specimens was collected and brought to the attention of the senior author by James B. Munro, East Stroudsburg University, based on material that he collected in northeastern Pennsylvania. In each of the above cases, the unpatterned larval form was the only color form of this species found

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² IDNR, Division of Entomology and Plant Pathology, 402 West Washington, Room W-290, Indianapolis, Indiana 46204.

³ Present Address: 9015 Rock Cliff, San Antonio, Texas 78230.

⁴ Department of Biological Sciences, University of North Texas, P.O. Box 5218, Denton, Texas 76203.

⁵ Present Address: Department of Biology, University of Texas Pan American, Edinburg, Texas 78539.

at the site. Typical color forms of *B. intercalaris* were not present in sites where collections were made of the unpatterned form.

MATERIAL EXAMINED

Material which formed the basis for this report includes the following larval, adult, and reared adult specimens:

OKLAHOMA: Pushmataha Co., Kiamichi R. at Hwy 2, 16.3. mi N Hwy 2-3 jct, D.E. Baumgardner, 16-IX-1993, 2L, and 14-X-1993, 2 reared male adults, 1 reared female adult, 7L. OK: Le Flore Co., Kiamichi R. at Hwy 259, approx. 0.5 mi S Hwy 63-259 jct, 18-VII-1993, D.E. Baumgardner, 2L. OK: Le Flore Co., Pigeon Crk at Hwy 63, approx. 5.5 mi W Oklahoma-Arkansas border, 19-VI-1993, D.E. Baumgardner, 1 male adult. OK: Pushmataha Co., Dry Crk at unnamed low water crossing, approx. 2.5 mi E Tuskahoma, 17-VII-1993, D.E. Baumgardner, 1L.

PENNSYLVANIA: Pike County, Blooming Grove Creek, 6, 27-VII 1993; 10, 24-VIII-1993; 9-IX-1993, and 4-X-1993, James B. Munro.

Representative vouchers have been deposited in the Purdue Entomological Research Collection, West Lafayette, Indiana, and University of North Texas, Denton, Texas.

IDENTIFICATION

Larvae of the unpatterned form will reach an impasse in the key couplet separating *Baetis intercalaris* from *B. flavistriga* McDunnough in Morihara and McCafferty (1979: couplet 19) because the tergal pale spots are not present. To accommodate identification of the unpatterned form, couplet 19 of the key may be modified to read:

19. Darker, well-marked abdominal tergites with two large submedian pale areas, often kidney shaped *B. flavistriga*

19'. Darker, well-marked abdominal tergites with 3 posterior round pale areas, middle spot often smaller than laterals or abdominal tergites uniformly gray or brown with pale parentheses-like marks at middle, anterior margin of each tergite *B. intercalaris*

Confirmation of tentative larval identifications using this modified couplet should continue to be accomplished by using the expanded diagnosis under the species discussion of *B. intercalaris* in Morihara and McCafferty (1979). In some specimens, the slide mounted larval exuviae of the unpatterned form showed indication of pale tergal areas on the anterior tergites when examined with indirect substage lighting.

The adult of the reared, atypical larva keys readily to *B. intercalaris* in the most recent keys to the *Baetis* species adults (Traver 1935) based on the elongated marginal intercalaries of the first interspace in the forewing. However, adults of the reared atypical specimens possessed a dark-brown thorax, rather



Figure 1. *Baetis intercalaris* (unpatterned form). Dorsal habitus (photograph).

than the black thorax of typical *B. intercalaris*. Such color differences in the adult stage have been regarded as within the observed limits of intraspecific variation in closely allied species, e.g., *B. flavistriga* (see Morihara and McCafferty 1979 and Traver 1935) and in *Baetis dubius* (Walsh) (Waltz, personal observation). Further comparisons of the adult male reared from the unpatterned larval form with adult males reared from typical *B. intercalaris* larvae showed no discernible morphological differences.

BIOLOGY AND DISCUSSION

Baetis intercalaris, widely distributed in the Kiamichi River drainage, was collected from third through fifth order streams in the upper, middle, and lower reaches of the drainage. Larvae were collected from gravel/pebble substrate in riffles. Other studies have reported similar habitats for this species (Bergman and Hilsenhoff 1978; Berner and Pescador 1988).

Baetis intercalaris may have two generations per year in the Kiamichi River drainage, consisting of a spring and a fall generation. Immature larvae were first collected in June 1993, with late instar and emerging larvae collected in October, indicating the fall generation. Although no larvae were collected before June, a single adult was collected in June 1993, suggesting the occurrence of a spring generation. In the northern regions of its range, *B. intercalaris* has been reported variously as univoltine (Bergman and Hilsenhoff 1978; Harper and Harper 1984), or bivoltine (McDunnough 1921, 1923; Ide 1935). Emergence of *B. intercalaris* occurs throughout the year in the southern regions of its range (Berner and Pescador 1988), and often has no cohort synchronization (Jacobi and Benke 1991).

The cause of the atypical color variation is unclear at this time. The atypical color form could represent a cryptic species. A second, and more probable cause, is that this atypical color form may be a result of some, as yet not identified, environmental factor causing the differences in color. Not only are there no obvious morphological differences in the typical versus the atypical forms, but the presence of patterning common to the typical form, that is vaguely discernible in at least some larvae of the atypical form, leads us to seek an environmental cause for the atypical coloration. All of the unpatterned form larvae reported herein were collected in the mid to late summer, or the second generation cycle. No earlier, or spring generation, collections of the unpatterned form are known to us. Additional studies, including rearings of both typical and atypical color forms from throughout the range of this species, and life history studies, will be required to better understand the source of this atypical coloration.

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